

# Observations of hunting attacks by the Powerful Owl *Ninox strenua* and an examination of search and attack techniques

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Many authors have recorded hunting attacks by diurnal birds of prey in Australia (Czechura 1979; Baker-Gabb 1984; Fawcner 1991; Olsen and Olsen 1992; Debus *et al.* 1993, 2007a,b; Burnett *et al.* 1996; Wilkins and Donato 1998; Olsen *et al.* 2006; Fisher 2010; Debus 2011; Mooney 2013; Smith 2013), but there are fewer accounts for owls (Robinson 1968; Baker-Gabb 1984; McNabb 1996; Olsen *et al.* 2006; Shelly 2006). This difference is perhaps related to the difficulty of observing nocturnal fauna without disturbing natural behaviours. In contrast, some owls from the Northern Hemisphere forage during the day (Olsen 2011); consequently more is known of hunting attacks in these species.

The diet of the Powerful Owl *Ninox strenua*, Australia's largest nocturnal bird of prey, has been extensively studied (Seebeck 1976; Tilley 1982; Traill 1993; Lavazanian *et al.* 1994; Pavey *et al.* 1994; Pavey 1995; Schulz 1997; Wallis *et al.* 1998; Webster *et al.* 1999; Kavanagh 2002; Menkhorst *et al.* 2005; Cooke *et al.* 2006; Fitzsimons and Rose 2010; Olsen *et al.* 2011; Bilney 2013). Despite this volume of dietary research, few authors have reported hunting attacks.

At least 13 observations of Powerful Owls attacking vertebrate prey were found in the scientific literature, three of which were successful. Robinson (1968) recorded a Sugar Glider *Petaurus breviceps* being snatched by a Powerful Owl; however, this incident occurred after the prey was unintentionally disturbed from a tree hollow by observers. Olsen *et al.* (2011) also recorded attacks on Sugar Gliders, both airborne and on tree trunks, but these hunting attempts were all unsuccessful. Kavanagh (1988) observed an owl handling a recently caught Greater Glider *Petauroides volans*, which it released in response to disturbance from a spotlight.

McNabb (1996) observed hunting attacks on Common Ringtail Possums *Pseudocheirus peregrinus* on two occasions and an unsuccessful tail-chase of a Crimson Rosella *Platycercus elegans*. Pavey *et al.* (1994) recorded four unsuccessful attacks on a flying-fox *Pteropus* sp., Common Brushtail Possum *Trichosurus vulpecula*, Scaly-breasted Lorikeet *Trichoglossus chlorolepidotus* and Crested Pigeon *Ocyphaps lophotes*, as well as a juvenile owl attempting

to capture an Eastern Water Dragon *Intellagama lesueurii*.

Hyem (1979) reported an opportunistic observation of a Powerful Owl on the road clutching a live Red-legged Pademelon *Thylogale thetis*, which escaped after the owl was displaced by an approaching vehicle. An attack on a Tawny Frogmouth *Podargus strigoides* was recorded by Chafer (1992), however the owl also abandoned the prey in alarm.

This note provides accounts of hunting attacks and handling of recently captured prey by Powerful Owls observed as part of an ongoing monitoring program in southern Sydney (Mo and Waterhouse 2015; Mo *et al.* in press). These observations combined with those of earlier authors present an opportunity to examine the search and attack techniques used by the Powerful Owl.

## Study area and observation routine

Powerful Owls in three breeding territories along the lower Georges River, southern Sydney (NSW), have been monitored since 2012 by more than 10 regular observers, including the authors. The main aims of the monitoring program were to further understand breeding success and habitat use in urban areas. The first territory comprised one bushland remnant in Oatley and another in Hurstville Grove, separated by a distance of 600 m over urban development. The second territory was in an area extending from Lugarno to Peakhurst, which like the first, included two bushland remnants separated by 400 m of developed area. The third territory was also located in Lugarno, 2 km southwest of the second territory, in a section of the Georges River National Park. Owls in this territory possibly also used bushland on the southern side of the Georges River.

Observations were staged between dusk and up to 3 hours after sunset. Diurnal searches for roosting owls was undertaken to ascertain their locations for the evening observations. On some occasions, observations were staged at later hours of the night; however, these attempts were heavily reliant on hearing calls to locate the owls. Over the study period, 400 to 500 nocturnal

sessions were staged at each territory, equating to between 450 and 600 observation hours per site. During nesting and post-fledging seasons, observations were recorded on a near-daily basis.

Unlike Powerful Owls in many previous studies, our breeding pairs and fledglings were habituated to human activity, sometimes roosting above walking tracks that received high visitation (cf. Carson 2013). As a result, the owls did not appear to be disturbed by observers being present, even during the nesting season. This tolerance provided an important advantage for recording behaviour.

Five successful hunting attacks were observed in three years of study, including one by a juvenile owl. The prey in these observations comprised three species of mammal (Common Ringtail Possum, Common Brushtail Possum and Grey-headed Flying-fox *Pteropus poliocephalus*) and two species of bird (Noisy Miner *Manorina melanocephala* and Australian Magpie *Cracticus tibicen*). This study also recorded eight unsuccessful hunting attacks on four bird species: Pied Currawong *Strepera graculina*, Australian Magpie, Sulphur-crested Cockatoo *Cacatua galerita* and Noisy Miner.

### Successful attack and handling of recently caught possums

The first successful kill was recorded on 17 December 2012. Two 6-month-old juveniles were practicing attacks at dusk, sally-striking thin tree branches in the absence of the adults (Mo and Waterhouse 2015). At 2230 h, one owl flew across open parkland to a large Port Jackson Fig *Ficus rubiginosa* approximately 200 m away. Continuous flights of this distance had not been recorded in these juveniles' development previously. There was a loud squeal as the owl landed on the fig tree. As the observer reached the site, the owl was clutching a young Common Ringtail Possum (~400 g body mass) on a perch. The prey probably died quickly as only one squeal was heard and it was motionless upon approach.



**Figure 1.** A Powerful Owl killing a Common Brushtail Possum. Photo, P. and A. Hayler.

In the two weeks leading up to this incident, this fig tree had been fruiting and frequently attracted possums. During this period, the owls also frequented this area, which had not previously been a regular haunt. For this reason, speculation arose that frequent visitation of the fig tree by prey species may have been attracting the owls.

An adult owl killing a medium-sized Common Brushtail Possum (~900 g body mass) was recorded on 12 October 2013. The incident occurred at 1813 h during twilight. The actual attack was not observed; the adult owl flew across open parkland approximately 7 min earlier and returned with the live possum in its talons. The possum struggled but had ceased any distress calls by the time it was observed. The owl perched in a tree and repeatedly bit the neck region (Fig. 1). The prey became motionless after approximately 1 min of the owl perching. The possum was decapitated quickly (Fig. 2), such that the precise moment it occurred was not noticed. The owl flew off to join two juveniles, which it fed morsels of the carcass.

### Successful attack on a Grey-headed Flying-fox

A successful capture of a Grey-headed Flying-fox was observed on 25 August 2014. Two adult owls and two juveniles had been roosting in the immediate vicinity of the nest hollow. The incident occurred within 30 min of the owls becoming active at dusk. The flying-fox was in a stationary position in foliage approximately 9 m below the owls. No vocalisations or movements of flying-foxes were heard during the observation period, such that we were not aware of their presence until the time of the attack.

Flocks of Noisy Miners, Pied Currawongs and Grey Butcherbirds *Cracticus torquatus* mobbed the owls for at least 20 min immediately before the attack. At 1738 h, one adult owl dropped abruptly from its perch and dived vertically into the foliage where the flying-fox was. The owl dangled upside-down with one foot holding the prey and the other clutching the foliage. It remained



**Figure 2.** The Powerful Owl manipulates a Common Brushtail Possum carcass after removing the head. Photo, P. and A. Hayler.



suspended for approximately 40 sec, looking around and pecking at the prey intermittently. As the owl ascended to its original perch, the prey's wings were seen drooping limply, indicating that it was dead at this time. The owl led the juveniles to an exposed branch where it fed them (Fig. 3). Still photographs of the feeding confirmed the identity of the prey as a flying-fox.

### Successful attack and handling of recently caught birds

Two incidents of Powerful Owls killing birds were observed, the first of which involved a lone adult owl attending two juveniles on 15 November 2014. At 2100 h, the owl left its perch in remnant bushland and crashed into the foliage of an isolated tree in open parkland 20 m away. It captured a roosting Noisy Miner (Fig. 4), which did not struggle after it was struck, indicating that it probably died instantly. The owl flew from branch to branch with the juveniles following until it settled on a perch and commenced feeding the juveniles.

The second incident occurred on 30 November 2014 at 2030 h. The perch of an adult owl was located by hearing the squawks of an immature Australian Magpie that had been captured. The attack occurred on an isolated tree in open parkland. The owl held the magpie until it died less than 1 min later, apparently not making any further attempt to kill it after the initial strike. After movement ceased, the owl proceeded to pluck some of the wing feathers and spent approximately 15 min feeding portions of the kill to two juveniles.

### Unsuccessful hunting attacks on birds

Eight hunting attacks that were unsuccessful were recorded, including five incidents in which owls pursued birds in flight.

The first few incidents were initiated by juvenile owls, such that they may not represent actual hunting attacks, but rather play attacks. On 22 September 2012 at 1830 h, a passing Pied Currawong was tail-chased by a juvenile over a distance of about 20 m. Three tail-chases of Sulphur-crested Cockatoos by juvenile owls were observed on 25 November and 4 December 2012. The pursuits occurred over distances from 60 to 100 m. One month before the first observation, the owls had developed an interest in nesting cockatoos moving in and out of a nest hollow, spending approximately 10 min at a time peering at it (Mo and Waterhouse 2015). By 25 November, the juvenile owls were frequently stationed on a branch overlooking the usual flight path of the cockatoos. On 4 December, one juvenile owl flew at a cockatoo as it returned to the hollow. Although the hunting attack was unsuccessful, contact with the prey was confirmed by two dropped back feathers.

An unsuccessful hunting attack on an Australian Magpie by an adult owl was observed on 16 October 2013 at 2033 h. At the time, one adult owl had left the vicinity to hunt, leaving the second adult present with two juveniles. The



**Figure 3.** Two adult Powerful Owls feeding portions of a Grey-headed Flying-fox kill to two juveniles. Photo, P. and A. Hayler.



**Figure 4.** A Powerful Owl with the carcass of a Noisy Miner in its talons. Photo, P. and A. Hayler.



**Figure 5.** An Australian Magpie wakes from its roost as an adult Powerful Owl flies away briefly. The magpie appears to focus its attention on the juvenile owl perched nearby. Photo, P. and A. Hayler.

owls landed in the same tree in which two magpies were roosting. The magpies awoke, but did not disperse (Fig. 5). The adult owl flew away briefly before crashing through the foliage in a sally-strike attempt to capture the magpie from behind (Fig. 6). The owl narrowly missed the magpie; however contact was confirmed by dropped feathers. The owl turned in flight and proceeded to pursue the magpie in the air over a distance of approximately 40 m. Since this incident, there have been numerous sightings of a magpie with a drooping wing close to the attack site, presumably the same individual (Fig. 7).

Two unsuccessful attacks on Noisy Miners were recorded on 24 November 2014. At dusk, a lone adult owl fed two juveniles the carcass of a small bird that had been caught the previous night. At 2110 h, the owl flew from the fringe of remnant bushland and undertook a glide attack on a roosting Noisy Miner in a tree approximately 30 m away in open parkland. The owl repeated this technique on another roosting individual 2 min later. In both cases, the miners closely evaded capture.

## Discussion

### Hunting habitat

The diet itself provides some information on hunting behaviour in Powerful Owls. Although some terrestrial fauna are taken (Hyem 1979; Chafer 1992; Pavey *et al.* 1994; Schulz 1997), the principal components of the diet are arboreal mammals and birds (Debus and Chafer 1994; Pavey 1995; McNabb 1996; Olsen *et al.* 2006; Fitzsimmons and Rose 2010; Bilney 2013). Preliminary examination of pellets collected in the study area show a high proportion of birds such as Noisy Miners (C. Lloyd *et al.* unpubl. data). The composition of the diet therefore shows that Powerful Owls hunt primarily in the canopy, indicating that forested areas and woodlands are important hunting habitat.

Like Pavey *et al.* (1994), we recorded several hunting attacks in open parkland, although the owls spent most of their activity periods in patches of remnant bushland. There is a high likelihood that hunting also occurred in suburbia, especially since possums and birds notably penetrate these modified environments in the Sydney region (Parsons *et al.* 2006; Hill *et al.* 2007). Our observations in suburbia were limited, owing to difficulties accessing private property.

### Search techniques

Seven major search techniques used by birds of prey have been defined by various authors (Fox 1977; Baker-Gabb 1984; Aumann 2001; Olsen *et al.* 2006; Olsen 2014): still-hunting (or perch-hunting), fast contour-hugging flight, soaring and prospecting, slow quartering, stalking on the ground, listening and flushing from cover.

Most of the hunting incidents recorded were examples of still-hunting, which involve carrying out ambushes from a stationary vantage point, and listening. In the case of the hunting attack on a flying-fox, the attack was made from directly above the prey, increasing the element of surprise. Still-hunting did not necessarily occur only when prey were unaware of the presence of owls. In the case of the unsuccessful attack on the magpie, a juvenile owl had drawn the attention of the magpie before the adult owl's hunting attack. Observations by Robinson (1968) and Olsen *et al.* (2011) were examples of still-hunting; however, the owl's behaviour in the former was initiated by observers disturbing prey from shelter.

In the successful attack on a ringtail possum, the owls flew a distance of 200 m to the site of the attack. The search technique could potentially be considered as a short-stay still-hunting punctuated by tree-to-tree flights; however the owls may have flown to that location because the fig tree was an important feeding area for their prey.

In the successful attacks of a brushtail possum and a magpie, the owls were not located before making the attacks. Therefore, the search technique for these attacks could not be determined. Likewise, for hunting attacks recorded by Hyem (1979), Kavanagh (1988), Chafer (1992) and McNabb (1996), the preceding events were unknown.

### Attack techniques

Six major attack techniques used by birds of prey have been described (Fox 1977; Baker-Gabb 1984; Aumann 2001; Olsen *et al.* 2006; Olsen 2014): the direct flying attack, tail-chasing, glide attack, stooping, pouncing and the feet-first drop.

The glide attack, also known as sally-striking (Higgins 1999), involves flying in to seize stationary prey, allowing the predator to close in with minimal detection. This is a common technique used by hawk owls *Ninox* spp. (Olsen 2014), recorded in Powerful Owls by Robinson (1968) and Olsen *et al.* (2011), and possibly in Chafer's (1992) observation. The glide attack was used in most of our hunting observations where the moment of impact was seen (hunting attacks on the ringtail possum, flying-fox and Noisy Miner, and unsuccessful hunting attacks on three birds). These observations confirm previous





**Figure 6.** A Powerful Owl narrowly misses an Australian Magpie in a glide attack. Note, the dropped feathers as the magpie escapes. Photo, P. and A. Hayler.



**Figure 7.** An Australian Magpie with a drooping wing six months after a near-miss with a Powerful Owl. Photo, M. Mo.

speculation that diurnal birds are often captured while roosting (Debus and Chafer 1994). The dangling posture of the owl in the hunting attack on the flying-fox has also been recorded by McNabb (1996) following a glide attack on a possum. This behaviour supports previous explanations of older juveniles snatching and hanging from foliage as behaviour related to honing their hunting skills (Mo and Waterhouse 2015).

The direct flying attack involves catching prey in mid-air, which Powerful Owls use to collect insects (McNabb 1996; Mo and Waterhouse 2015) and presumably bats (Olsen 2014). Olsen *et al.* (2011) remarked on the agility of the Powerful Owl in flight, able to turn 180° and briefly hover. None of the hunting attacks on vertebrates observed in this study were examples of this technique.

Our observations of tail-chase attempts were limited to juveniles and one adult in the event of a failed glide attack. None of these cases resulted in successful attacks, which may suggest that this attack technique is mostly used by inexperienced juveniles or as a secondary method. McNabb (1996), however, recorded a few tail-chases carried out by mature individuals as the primary attack technique. To date, no successful tail-chases by Powerful Owls have been reported.

Stooping was observed only once in this study, by the juvenile owl attempting to capture a cockatoo as it returned to a nesting hollow. Since the owls were repeatedly stationed on a perch above the hollow in the days leading up to the incident, it appears that Powerful Owls may learn the routines of their prey. There are some advantages to stooping at prey as it lands: the prey may be preoccupied by its own activity and unaware of movement behind it, and the owl may hold the prey against the branch or tree trunk upon impact. Powerful Owls have also been recorded stooping at airborne Sugar Gliders (Olsen *et al.* 2011), though unsuccessfully, and possibly flying-foxes (C. Lloyd, pers. comm). The feet-first drop has been observed in hunting attacks by some hawk owls (Olsen 2014), however remains to be confirmed in the Powerful Owl.

Based on the immense strength of the talons, Fleay (1944, 1968) inferred that prey taken by Powerful Owls would succumb to sudden death on contact; however, hunting observations made since (Robinson 1968; Hyem 1979; McNabb 1996), including in this paper, show that possums and birds may survive the initial impact if a killing grip is not achieved. Even the Tawny Frogmouth that was momentarily grasped on the head by an owl was not killed instantly (Chafer 1992). However, some of the carcasses of small birds held by the owls during the day were superficially intact (i.e. not decapitated), suggesting that in these cases, the initial impact or grip pressure was probably sufficient to kill the prey. Robinson (1968) and McNabb (1996) both recorded the owls immobilising captured mammalian prey by biting the face and neck. In our observation of an owl handling a recently caught brushtail possum, the owl did not kill the prey urgently, flying with the live prey after the capture. Kavanagh (1988) and McNabb (1996) also recorded a live mammals being brought back during the



post-fledging period. A possible reason for the adult owls not killing the prey immediately may be to provide a demonstration for the developing juveniles.

### Future research

The Powerful Owl is not the reclusive species once thought restricted to highland forests (Debus and Chafer 1994). In this study, repeated observations of individual pairs were possible because of their presence in the urban

environment (Bain *et al.* 2014), leading to new insights into its behaviour (Mo and Waterhouse 2015; Mo *et al.* in press). Observations in this paper form a substantial addition to the few accounts of hunting attacks by Powerful Owls in the scientific literature (Robinson 1968; McNabb 1996); however, the sample size for examining this species' search and attack techniques is still limited. Future observations of successful kills should be also published as they become available.

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